

36. (New) The method of claim 9, wherein said operation of matrix or vector algebra includes obtaining an outer product matrix of two vectors V_i for $i = 1, 2, \dots, m$, and W_j for $j = 1, 2, \dots, n$,

wherein said step of subjecting comprises obtaining a set of dimeric, single-stranded oligomers to represent an outer product of vectors V and W , each of said dimeric oligomers comprising (i) a first single-stranded oligomer sequence selected from the group consisting of E_i or \underline{E}_i for each i -th component of V for $i = 1, 2, \dots, m$, which oligomer is joined at its 3' end to the 5' end of (ii) a second single-stranded oligomer sequence selected from the group consisting of E_j or \underline{E}_j for each j -th component of W for all $j = 1, 2, \dots, n$,

wherein the step of detecting includes determining the concentration of said dimeric oligomers comprising oligomer sequences corresponding to the i -th component of V and the j -th component of W .

37. (New) A method for obtaining a data set V_i^b from an oligomer-based, content-addressable memory following input of a data set U_i^b that represents a portion of V_i^b ,

wherein data elements in the form of m -component vectors $V = \sum_i V_i e_i$ are represented in the memory by a set of the oligomers E_i and \underline{E}_i that are a subset of all single-stranded oligomers and are in 1:1 correspondence with the basis vectors e_i for $i = 1, 2, \dots, m$ in an abstract m -dimensional vector space;

wherein oligomers E_i and \underline{E}_i have complementary nucleotide sequences, with E_i oligomers representing the i -th component of V for which the amplitude V_i is positive, and \underline{E}_i representing the i -th component of V for which V_i is negative; and

wherein the concentration of each of oligomers E_i and \underline{E}_i is proportional to the absolute value of the amplitude V_i of the i -th component of V ;

the method comprising:

(a) preparing a content-addressable memory representing memory matrix T_{ij} in which are stored data sets corresponding to vectors V_i^a for $a = 1$ to $a = n$, where $i = 1, 2, \dots, m$, wherein T_{ij} is the sum of all of the outer products $V_i^a V_j^a$ for $i \neq j$, the preparing of the memory representing the matrix T_{ij} ;

comprising obtaining for each vector V^a a set of dimeric single-stranded oligomers, each of which comprises a first single-stranded oligomer sequence selected from the group consisting of E_i or \underline{E}_i for each i-th component of V^a for $i = 1$ to $i = m$, and further comprises a second single-stranded oligomer sequence selected from the group consisting of E_j or \underline{E}_j for each j-th component of V^a for $j = 1$ to $j = m$, except for $i = j$; and then pooling said sets of dimeric oligomers obtained for each vector V^a for $a = 1$ to $a = n$ to form the set of oligomers of the content-addressable memory representing the matrix T_{ij} ;

- (b) combining said pool of dimeric oligomers with a set of oligomers representing partial data set U_i^b under conditions wherein oligomer sequences E_i^b and \underline{E}_i^b of data set U_i^b hybridize specifically to complementary sequences E_j and \underline{E}_j present in said memory pool oligomers; and

obtaining an isolated set of monomeric oligomer strands X_i comprising the first single strand oligomer sequences E_i and \underline{E}_i of said memory pool of dimeric single stranded oligomers that hybridized specifically to said U_i^b oligomers, wherein said X_i oligomers do not further comprise said E_j and \underline{E}_j oligomers of the second single-stranded sequences of said memory pool oligomers that are complementary to said U_i^b oligomers;

- (c) combining said set of X_i oligomers with a set of single-stranded saturating oligomers comprising a set of E_i and \underline{E}_i oligomers representing the complete set of basis vectors e_i for $i = 1$ to m , wherein the E_i and \underline{E}_i oligomers are sub-stoichiometric relative to said set of X_i oligomers, in that the number of oligomers in the set of X_i oligomers is greater than the number of saturating oligomers, so that complementary sequences hybridize to each other, denaturing the resulting duplex molecules, and isolating the subset of X_i oligomer that hybridized specifically to said E_i and \underline{E}_i sequences, to obtain a set of saturated X_i strands, $S(X_i)$;
- (d) repeating steps (b) and (c) iteratively, using the set of saturated X_i strands, $S(X_i)$ obtained in each previous implementation of step (c) as the set of oligomers representing partial data set U_i^b employed in the subsequent implementation of step (b), until successive iterations yield the same set of oligomer strands X_i produced by step (b) that represents data set V_i^b .

Enter the following amended claims:

18. The method of claim 37, wherein the oligomers independently comprise subunits selected from the group consisting of deoxyribonucleotides, ribonucleotides, and analogs of deoxyribonucleotides or ribonucleotides; and any single oligomer comprises one or a combination of two or more of said different types of subunits.
19. The method of claim 37 wherein each of said oligomers forming said content addressable memory matrix T_{ij} comprises, in order from the 5' end to the 3' end, (a) an oligomer strand comprising a nucleotide sequence representing an i-th component of V selected from the group consisting of E_i and \underline{E}_i for $i = 1$ to $i = m$, (b) an oligomer strand comprising a nucleotide sequence representing a j-th component of V selected from the group consisting of E_j and \underline{E}_j for $j = 1$ to $j = m$, wherein $j \neq i$, and (c) a nucleotide sequence F that is not complementary to any sequence E_i or \underline{E}_i for $i = 1$ to $i = m$.
22. The method of claim 37 wherein said single-stranded oligomers comprising a complete, stoichiometric set of E_i of step (c) and \underline{E}_i are anchored to a solid support.
27. The method of claim 9 wherein said operation of matrix or vector algebra is determining the inner product of two vectors V and W , and said method comprises:
 - (i) obtaining for each vector V and W , sets of single-stranded oligomers E_i and \underline{E}_i representing the components of the vector, wherein the concentrations of the oligomers E_i and \underline{E}_i are proportional to the absolute values of the amplitudes of the components they represent; and
also obtaining a set of single-stranded oligomers E_i and \underline{E}_i representing the components of vector W that are complementary to said oligomers representing vector W , wherein the relative concentrations of the oligomers representing W are proportional to the concentrations of their complementary oligomers in W ;
 - (ii) combining samples of the oligomers representing vector V with samples of the oligomers representing vectors W and \underline{W} in separate respective first and second reaction mixtures and measuring R_+ and R_- rates of hybridization associated with the respective